



W66 N220 Commerce Court • Cedarburg, WI 53012 • USA
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ENGINEERING TEST REPORT # 309112M
LSR Job #: C-772

Compliance Testing of:
Schlage AD-300 Wired Door Lock with MultiTech reader

Test Date(s):
June 17th to June 19th 2009 and December 3rd 2009

Prepared For:
Ingersoll-Rand Company
Schlage Wyreless Access
245 W. Roosevelt Road
Building 7, Suite 48
West Chicago, IL 60185

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart B, Section 15.109 (Class B)

Unintentional Radiators

<p>Test Report Reviewed by: Teresa A. White, Quality Manager</p> <p>Signature: <i>Teresa A. White</i> Date: December 23, 2009</p>	<p>Authorized/Tested by: Khairul Aidi Zainal, Senior EMC Engineer.</p> <p>Signature: <i>Khairul Aidi</i> Date: December 23, 2009</p>

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart B, Section 15.109
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for a Digital Device or a Non-Intentional Radiator
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	<ul style="list-style-type: none"> • Commercial, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-15	2008	Code of Federal Regulations – Telecommunications
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.

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1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.lsr.com. Accreditation status can be verified at A2LA’s web site: www.a2la2.net.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	Ingersoll-Rand Company
Address:	11819 N. Pennsylvania St. Carmel, IN 46074
Contact Person:	Sheldon White
Contact Phone:	317.810.3166
Contact Email:	Sheldon_white@irco.com

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Schlage AD-300 with MultiTech plus keypad
Model Number:	23507262 (With Keypad). 23507296(Without Keypad).
Serial Number:	N/A

2.3 ASSOCIATED ANTENNA DESCRIPTION

There are two antennas associated with the EUT:

1. The antenna for the 127 kHz transmitter is a loop antenna made from 33 gauge wire. The coil is in series with a 1500pH tuning inductance.
2. The antenna for the 13.56 MHz transmitter is a 2 baluns, 2turn loop antenna terminated to ground and 180° out of phase. The antenna is a PCB trace around the PCB.

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2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Operating Voltage	115 VAC
Highest Frequency on Board	8 MHz
Spurious (worst case) at 3m	27.3 dBuV/m at 3m (156.9 MHz)
Microprocessor Model # (if applicable)	PIC24F128GB106.
EUT will be operated under FCC and IC Rule Part(s)	47 CFR 15.109 and 15.107 IC: RSS-GEN 2007 and RSS-210, Issue 7, 2007
Portable/Mobile	<input type="checkbox"/> Portable <input checked="" type="checkbox"/> Mobile
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

2.5 PRODUCT DESCRIPTION

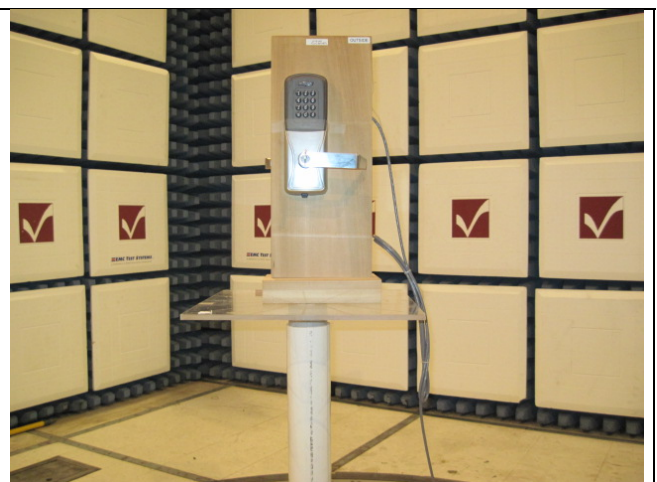
The Schlage AD-300 is an open architecture product designed to interface with Schlage brand access control panels as well as all other third party panels which use the Schlage RSI RS-485 protocol. When using a third party panel that does not use the Schlage RSI RS-485 protocol, the addition of a PIB300 is required. Normal operation is on-line mode. Information contained in the user credential is passed to an ACP (Access Control Point), which controls lock functions and maintains audit trails of the credential used. The locking function ensures that the inside lever allows egress and outside lever be locked.

The AD-300 can have any one of the following ACPs:

1. Magnetic Stripe reader with keypad.
2. Magnetic stripe reader.
3. Multitech reader (125 kHz and 13.56 MHz) with keypad.
4. Multitech reader (125 kHz and 13.56 MHz).
5. Keypad reader.
6. 125 kHz reader with keypad.
7. 125 kHz reader.



ACP:Multitech reader with keypad



AD-300 with Multitech Reader

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The Multitech reader has the capability to read ID badges at 127 kHz (PROX) and 13.56 MHz. When **both** transmit capability is active the transmitter never transmits at the same time. The Multitech will scan ID cards by transmitting a 127 kHz signal first, and if there is no response it will turn off the 127 kHz and then transmit the 13.56 MHz signal. This process will then repeat.

The Multitech reader comes in two options:

1. With a keypad (as in figure).
2. Without keypad.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature: 70 °
Humidity:42%
Pressure:743 mmHg

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
15.107	Power Line Conducted Emissions Measurements	Yes
15.109	Un-Intentional Radiated Emissions	Yes

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None Yes (explain below)

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

None Yes (explain below)

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EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.109, and Industry Canada RSS-210, Issue 7 (2007), Section 7 for non-intentional radiators.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

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EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was powered by DC adapter that was connected to the AC Mains

The applicable limits apply at a 3 meter distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment.

5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 1000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities

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5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz)

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
EMI Receiver		E4407B	
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.109 for a non-intentional radiator [Canada RSS-210, Issue 7 (2007), Section 7. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

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5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The following table depicts the Class **B** limits for an unintentional radiator. These limits are obtained from Title 47 CFR, Part 15.109(a), for radiated emissions measurements.

Frequency (MHz)	3 m Limit ($\mu\text{V/m}$)	3 m Limit ($\text{dB}\mu\text{V/m}$)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-10,000	500	54.0

Sample conversion from field strength $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$:

$$\text{dB}\mu\text{V/m} = 20 \log_{10} (\text{3m limit})$$

from 30-88 MHz for example: $\text{dB}\mu\text{V/m} = 20 \log_{10} (100)$
 $40.0 \text{ dB}\mu\text{V/m} = 20 \log_{10} (100)$

Note: Limits are rounded to the nearest tenth of a dB.

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5.6

DATA CHART – RADIATED EMISSIONS TEST

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: 47CFR, Part 15.109

Frequency Range Inspected: 30 MHz to 1000 MHz

Manufacturer:	Ingersoll-Rand Company					
Date(s) of Test:	June 17 th to June 19 th 2009					
Test Engineer(s):	Aidi Zainal					
Voltage:	115 VAC					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
EUT Power:	√	Single Phase 115 VAC			3 Phase ___ VAC	
		Battery			Other:	
EUT Placement:	√	80cm non-conductive table			10cm Spacers	
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber			3/10m OATS	
Measurements:		Pre-Compliance		Preliminary	√	Final
Detectors Used:		Peak		√	Quasi-Peak	Average

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dB μ V/m)	15.109 Limit (dB μ V/m)	Margin (dB)
86.7	V/TT	1.00	75	24.1	40.0	15.9
89.9 Note 1	V/TT	1.00	0	20.4	43.0	22.6
97.8 Note 1	V/TT	1.00	185	21.1	43.0	21.9
130.1 Note 1	V/TT	1.00	172	22.8	43.0	20.2
136.2 Note 1	V/TT	1.00	0	23.4	43.0	19.6
156.9	V/TT	1.00	187	27.3	43.0	15.7
406.8 Note 1	H/TT	1.53	254	16.8	46.0	29.2
432.5 Note 1	V/TT	1.00	127	18.6	46.0	27.4
471.1 Note 1	V/TT	1.00	181	20.1	46.0	25.9
563.9 Note 1	H/TT	1.00	105	22.2	46.0	23.8
599.6 Note 1	V/TT	1.00	313	20.8	46.0	25.2

Notes:

- Intermittent signal.
- TT = Table Top, H = Horizontal, V = Vertical.

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5.7 Test Setup Photo(s) – Radiated Emissions Test

EUT on Test Pedestal



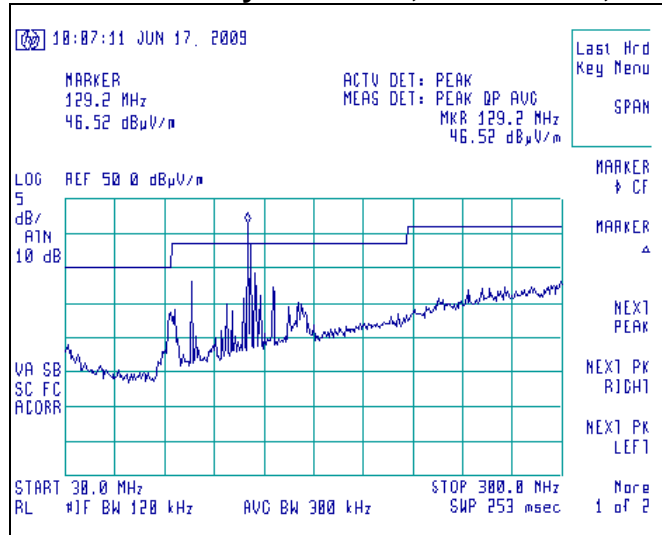
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5.8 Screen Captures - Radiated Emissions Testing

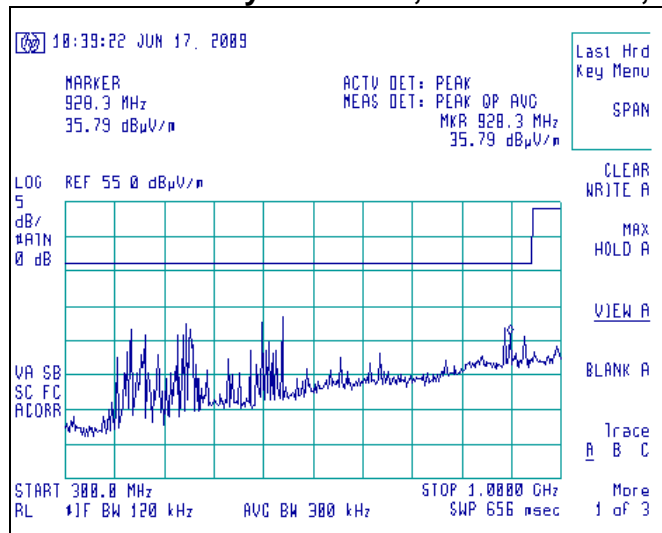
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Antenna Vertically Polarized, 30-300 MHz, at 3m



Antenna Horizontally Polarized, 300-1000 MHz, at 3m



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EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.107

6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 7, 2007). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided inside the 3 Meter Semi-Anechoic Chamber via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 Test Procedure

The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1, Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
Spectrum Analyzer	Agilent	E4446A	US45300564
LISN	EMCO	3816/2NM	9701-1057
Transient Limiter	HP	119474A	3107A01708

6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.107 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

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6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dB μ V)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW \geq 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

6.6 TEST DATA CHART- CONDUCTED EMISSIONS TEST

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.107 Class B

Manufacturer:	Ingersoll-Rand Company				
Date(s) of Test:	December 3 rd 2009				
Test Engineer:	Peter Feilen				
Voltage:	115 VAC				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
Test Location:	√	AC Mains test area		Chamber	
EUT Placed On:	√	40cm from Vertical Ground Plane	√	10cm Spacers	
	√	80cm above Ground Plane		Other:	
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak	√	Quasi-Peak	√ Average

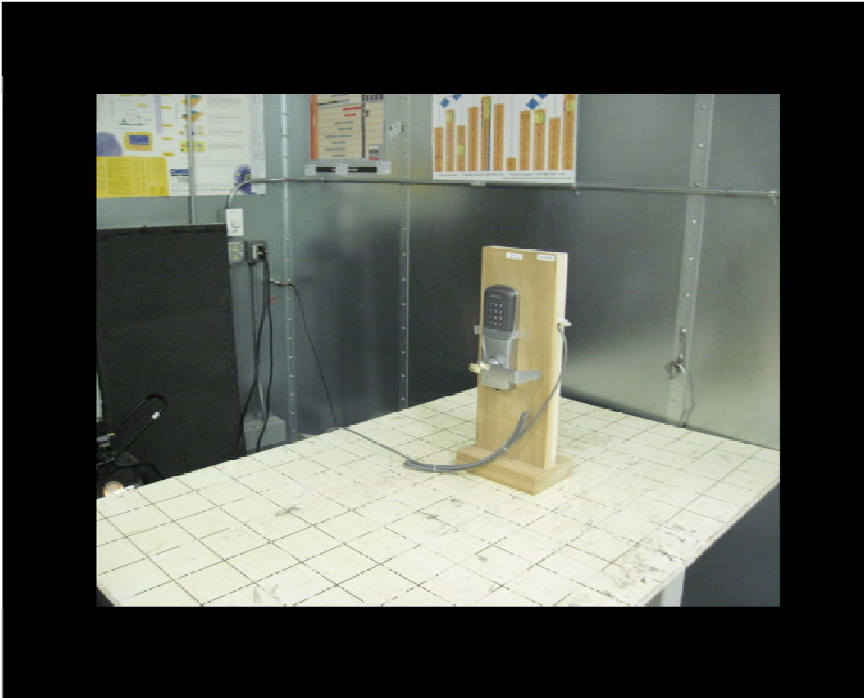
Frequency (MHz)	Line	<u>QUASI-PEAK</u>			<u>AVERAGE</u>		
		Q-Peak Reading (dB μ V)	Q-Peak Limit (dB μ V)	Quasi-Peak Margin (dB)	Average Reading (dB μ V)	Average Limit (dB μ V)	Average Margin (dB)
0.404	2	38.6	57.8	19.2	16.1	47.8	31.7
27.110	2	29.2	60.0	30.8	18.3	50.0	31.7
1.070	1	27.8	56.0	28.2	13.0	46.0	33.0
24.000	1	23.7	60.0	36.3	19.9	50.0	30.1
27.110	1	32.5	60.0	27.5	20.7	50.0	29.4

Notes:

- 1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.

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6.7 Test Setup Photo(s) – Conducted Emissions Test

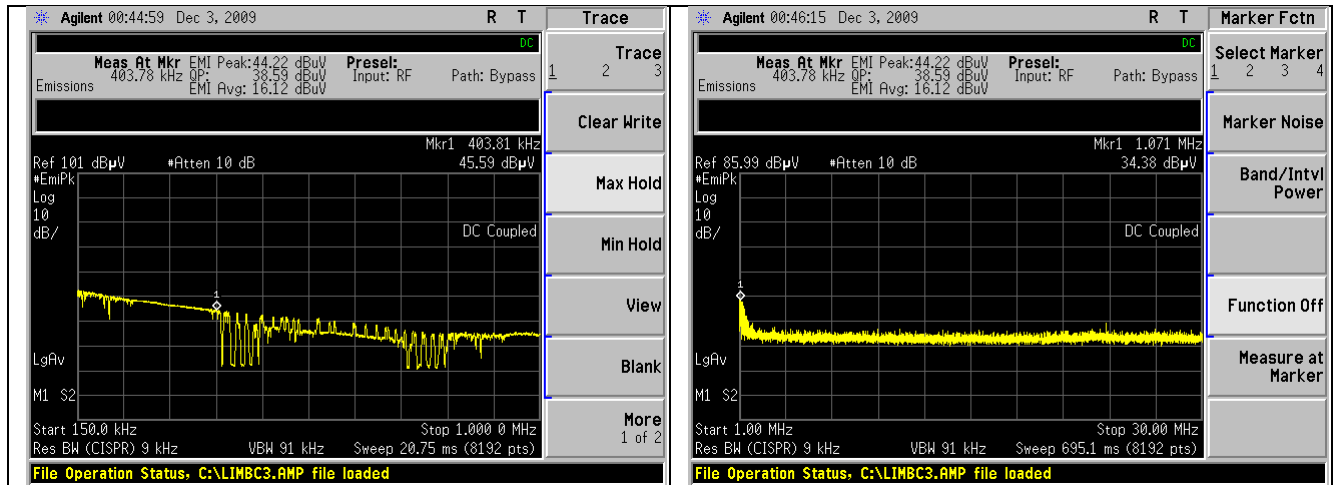


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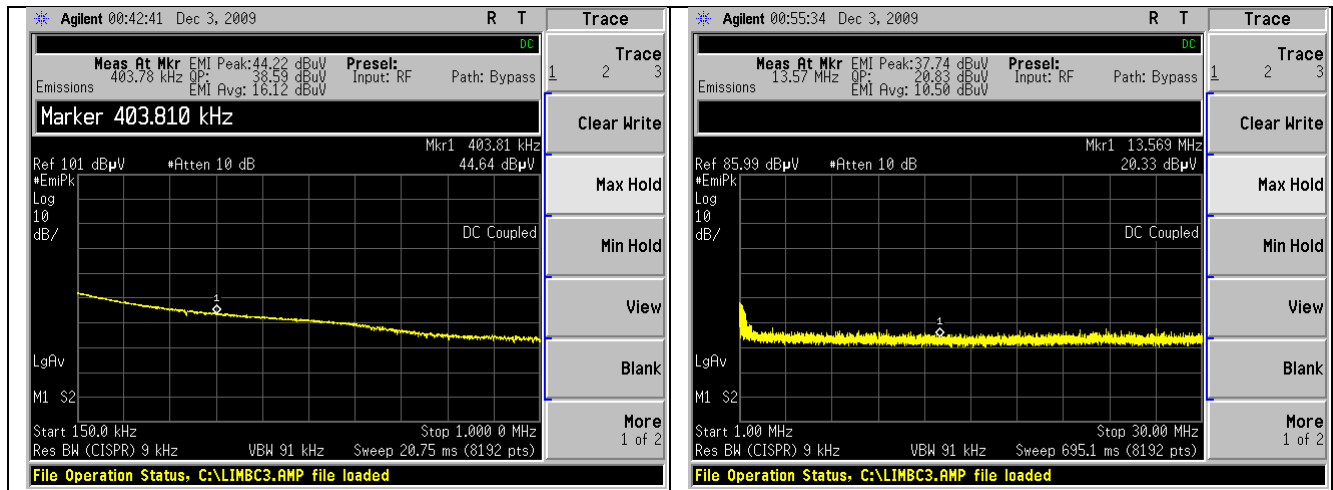
6.8 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.107.

Line 1





Line 2



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APPENDIX A

 LS RESEARCH LLC Wireless Product Development Equipment Calibration		Date : <u>8-Dec-2009</u>		Type Test : <u>Conducted Emissions</u>		Job # : <u>C-772</u>		
		Prepared By : <u>Aidi</u>		Customer : <u>Ingersoll Rand</u>		Quote # : <u>309380</u>		
No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	aa 960008	LISN	EMCO	3816/2NM	9701-1057	12/29/2008	12/29/2009	Active Calibration
2	aa 960031	Transient Limiter	HP	11947A	3107A01708	9/15/2009	9/15/2010	Active Calibration
3	ee 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration
4	ee 960158	RF Preselector	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration
Project Engineer: <u>Aidi</u>			Quality Manager: <u>Teresa</u>					

 LS RESEARCH LLC Wireless Product Development Equipment Calibration		Date : <u>19-Jun-2009</u>		Type Test : <u>Radiated Emissions</u>		Job # : <u>C-589</u>		
		Prepared By : <u>AIDI</u>		Customer : <u>Ingersoll Rand</u>		Quote # : <u>309112</u>		
No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960013	EMI Receiver	HP	8546A System	3617A00320:3448A	9/23/2008	9/23/2009	Active Calibration
2	ee 960014	EMI Receiver-filter section	HP	85460A	3448A00296	9/23/2008	9/23/2009	Active Calibration
3	aa 960077	Bicon Antenna	EMCO	93110B	9702-2918	11/24/2008	11/24/2009	Active Calibration
4	aa 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/20/2008	10/20/2009	Active Calibration
5	aa 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	12/23/2008	12/23/2009	Active Calibration
Project Engineer: <u>AIDI</u>			Quality Manager: <u>Teresa</u>					

Prepared For: <u>Ingersoll Rand</u>	EUT: <u>AD300 with MultiTech reader</u>	LS Research, LLC
Report #: <u>309112M</u>	Model #: <u>23507262 (With Keypad)</u> <u>23507296 (Without Keypad)</u>	Template: <u>15.109 Class B RX (8-21-08)</u>
LSR Job #: <u>C-772</u>	Serial #: <u>n/a</u>	Page 19 of 21

APPENDIX C
Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

Prepared For: Ingersoll Rand	EUT:AD300 with MultiTech reader	LS Research, LLC
Report #: 309112M	Model #: 23507262 (With Keypad) 23507296 (Without Keypad)	Template: 15.109 Class B RX (8-21-08)
LSR Job #: C-772	Serial #: n/a	Page 21 of 21